Vibration Detector

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This little circuit may act as a vibration-activated burglar alarm. The sensor, which may be secured unobtrusively to a door or a window, is a an inexpensive piezo buzzer. Piezo ceramic material deforms under application of voltage, but the reverse also applies, i.e., a piezo ceramic element will produce a voltage if it is deformed in any way, by acoustic waves (sound) or mechanical vibration.

The first amplifier, T1, raises the piezo signal by about 100 times. Transistor T2 acts as a detector with a collector voltage of just 50 mV. Because R3 takes the base of T2 straight to the positive supply line, this transistor will conduct all the time and not add to the amplification. If necessary, more gain can be obtained by connecting the top end of R3 to the collector of T2. The next stage, T3, provides a voltage gain of about 3 times and drives the pulse rectifier, D1. When a sufficiently high pulse level is detected, T4 will rapidly charge C6 which, in turn, will slowly discharge via R9 and the high resistance presented by R10/T5. The value of C6 is subject to experiments because it alone determines the on time of the relay.

The cable between the sensor and the input of the circuit should be shielded and as short as possible. If strong RF fields are a problem, connect a 1-nF ceramic capacitor between the base of T1 and ground.

Finally, 'known' sources of vibration (including sound but also a large relay) should be kept away as far as possible from the sensor because they may cause false triggering of the alarm and/or oscillating behaviour.

Current consumption of the circuit will be of the order of a few milli-amps plus, of course, the relay energizing current.

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